

Weekly Report

2017.06.12-2017.06.

1. This Week

Wavelines

1. Analyze the result of the transfer entropy between buses and get the following points:

- when using the entire time series to compute the total transfer entropy, we can find that under different types of electrical faults, different variables are taking control of the system.
- when computing the transfer entropy using time sliding window, we cannot find obvious pattern that at the exact moment the fault takes place (and the short time period after that), the transfer entropy between buses is not obvious. (This could be that there's no obvious value difference between buses at that time, so no information entropy.) This is not easy to understand.

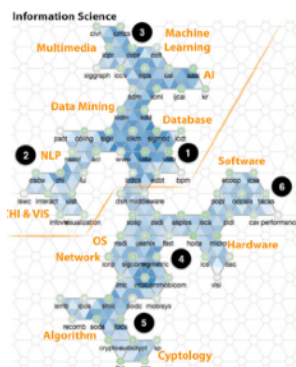
2. Talk to Guo Fangzhou about applying statistical method (like SQC) to distinguish important correlation relationships between temporal variables of devices. The problem is about **1**. how to balance or to organize the macro-relationship (between multiple variables) and a micro-relationship (between pairwise variables). Tcptree abstract a TCV space and a partition tree model to handle the macro-relationship and micro-relationship by digging and partitioning in the tree. Another problem is about **2**. how to distinguish between the important correlation change between two buses (for example, at time t_1 , variable_A on device_i mostly influence variable_B on device_j, but at time t_2 , variable_C on device_i mostly influence variable_B on device_j). And an idea is listed as follow: (for more clear clarification, I'll write it in Chinese.)

总体思路：

之前就有思路是将电网的拓扑结构中的变化视作动态图来对其进行研究，但是由于电网拓扑结构不会发生变化，发生变化的仅仅为结构中节点和边的各个变量的数值，因此会导致pattern不明显的问题。我们希望通过对于电网拓扑图的进行一些变动，使其变成动态变化更加明显的动态图，之后使用动态图的研究方法会更加顺利。

主要方法：

1. 对于电网拓扑结构中的每个节点我们都有若干个属性（我们先假设属性量超过3个），那么对每个节点，我们都可以利用曹楠老师在untangle map中提出的布局算法，计算出各个变量之间的相关性后为每一个节点生成一个layout：相关性高的变量会互相连接成为三角形。



2.在上一步中，我们可以得到每个节点的各个变量之间的相关性关系，由于每个节点的相关性关系不同，因此每个节点产生的布局均是不同的。之后，我们可以计算得到，各个节点的各个变量之间的相关性。我们在电网拓扑图中，使用由步骤1产生的布局节点链接图（三角网格组成）代替原有的节点，并在此基础上根据计算出的各个节点之间的变量相关性在图中增加代表相关性的边。

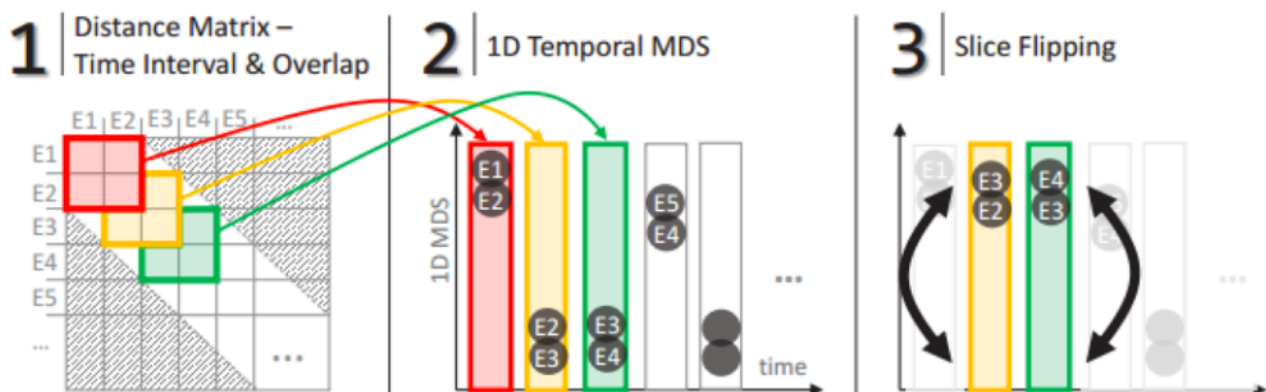
3.由此，我们得到的图结构中，包含了节点内部变量的相关性关系，也包含了节点与节点间的变量相关性，且在时间轴上，我们得到的图将是一个动态图，不仅图的拓扑结构会发生变化，节点和边的值也会发生变化。在此基础上，我们再使用动态图的方法，或是使用统计方法（SQC）去检测重要的信息，将会使结果更make sense。

Others

- 1.Finish the first version of the treatise: uncertainty data visualization
- 2.Do the seminar courses' projects
- 3.Prepare for exams

Paper Reading

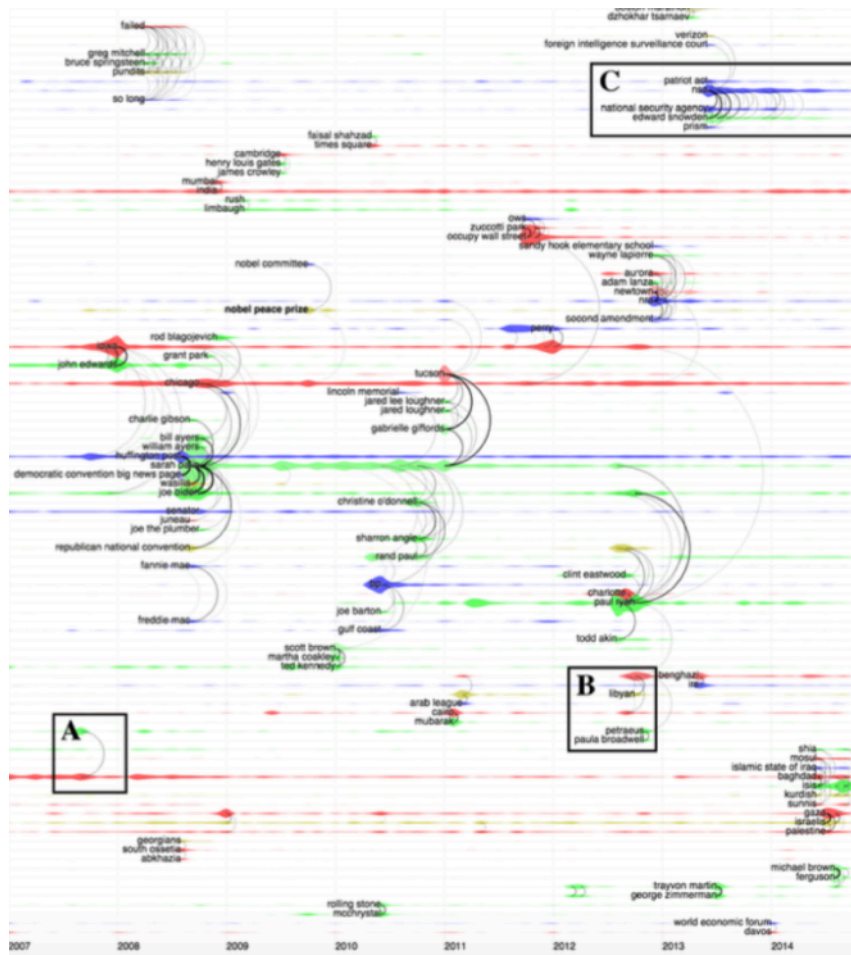
1.Temporal MDS Plots for Analysis of Multivariate Data



This paper presents a temporal MDS method for multivariate data to overcome the problem of meaningless coordinates between MDS at different time points. There are 3 steps: (1) Compute the weighted distance matrix between entries, a sliding window with overlap is applied and (2) 1D MDS computed for each window separately. The result is sequentially aligned on the time axis. (3) Because MDS is not invariant to rotation, a slice flipping method is applied.

2.TimeArcs: Visualizing Fluctuations in Dynamic Networks

This paper presents a new storyline like way to present the change of dynamic networks. Each line represents an individual and the time information is encoded on the horizontal line. The topology of the network is encoded by the curves linking different individuals.



2. TODO

1. Prepare for the exams and do homework
2. Talk to Prof. Chen to make the plan for the next step of wavelines and get to do with it. (After finished all my exams next tuesday).